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Learning sewing techniques through an inquiry

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Abstract

This study examines an inquiry method used in teaching sewing techniques to textile teacher students. The first-year students (N=26) received an open-ended clothing design task and they were expected to engage in an autonomous learning process. The result of the study demonstrates a shift from belief mode to design mode in studying sewing techniques. The students approached design mode in different ways, and the simplest way was based on a single insight of a design solution. In more complex approaches, the students built a unique construction detail through a source-oriented or model-oriented inquiry.

Keywords: clothing construction; craft; design; diary study; inquiry; sewing; teacher education

1. Introduction

The need to learn sewing skills has essentially changed during the last century. Before the ready-made apparel industry, learning sewing skills was an important part of preparing young women for home-making roles. Later on, learning sewing techniques was viewed as important to job preparation in the textiles and apparel industry. Nowadays, the need to learn sewing is related more and more to creative rather than economic issues (Kean & Levin, 1989; Laamanen & Seitamaa-Hakkarainen, 2009). For example, home sewers may appreciate expressive, aesthetic, and quality considerations related to self-made textiles and clothes.

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Traditionally, learning sewing techniques is based on watching a demonstration and by sewing garment details piece by piece (Slocum & Beard, 2005). In this case, the goals and resources of problem solving are initially known. As opposed to this, designing represents an ill-structured process, in which the goals and resources are defined during the problem solving process. In order to consider construction details as improvable artefacts rather than facts, students should be guided to move from a belief mode to a design mode (cf. Bereiter & Scardamalia, 2003). Design problems are open ended and designing is generally considered to be a complex and iterative problem solving process; i.e., design solutions emerge gradually as a process of structuring and restructuring the problem, defining and redefining constraints of designing, and generating and testing design solutions (Cross, 2001; Goel, 1995).

In the sewing-based curriculum, Montgomery (2006) has recommended a shift from a technical approach to a critical approach. In the technical approach, the students receive knowledge transmitted from the teacher, whereas in the critical approach, solutions to problems are discovered collaboratively through the investigation process. In the critical approach, sewing is connected to broader concepts such as resource management, caring for family members and social responsibility (Montgomery, 2006, 50). In the technical approach, teacher-made samples with step-by-step procedures can stifle students' own inquiry, distort what clothing construction is all about, and impede students' learning.

Typically sewing skills are taught using individual projects that are completed for personal use. Pilot initiatives have shown that learning sewing techniques can be naturally connected to the collaborative projects (Seitamaa-Hakkarainen, Lahti & Hakkarainen, 2005). In these collaborative projects, textile teacher students designed and manufactured products for special groups not for personal use (e.g., clothes for premature babies and tactile books for visually impaired). The greater emphasis was placed on the inquiry process rather than on the development of expert sewing skills and techniques. However, it is evident that the students learnt both problem solving and sewing skills during these projects. Further research is needed to redefine new teaching methods for sewing, clothing and textiles. The purpose of this study is to examine students' own reflections on their inquiry process during the sewing course in textile teacher education.

2. Inquiry-based approaches to sewing, clothing and textiles

Learning sewing skills is a complex and challenging process. Students have to learn to use several tools (e.g., sewing machines; see Miyake, 1986) and to understand garment and textile structures in order to execute individual design projects. In textile teacher education, there exist the practical challenges of teaching basic sewing skills in a limited time to students with widely varying skill levels. Thus, there is a need of a teaching method that allows more individualized instruction.

Learning through projects is a common feature in practice-based design education. Lee (2009) has identified different project types in use in a faculty of design. For example, inquiry methods are described as autonomous, highly individualised project experiences, whereas activity methods have the same features as the traditional lecture-demonstration method (e.g., step-by-step guides and directive instruction). As the level of independence rises, so does the complexity and variability of resources and student experience, but also the potential for authenticity and depth (Lee, 2009, 554). Inquiry-based learning aims to extend students' experience to alternative methods of working and at the same time facilitate their self-learning skills. In parallel with self-exploratory activities, the peers can be a considerable design knowledge source for students (see Chiu, 2010).

In the progressive inquiry model of collaborative designing, participants search for and are working with new information that allows reasoning and problem solving to proceed (Seitamaa-Hakkarainen et al., 2005). Shreeve, Bailey and Drew (2003) found that fashion design students exploited new information in different ways; the simplest way was undertaken to reproduce the elements of the found material in the

final product, and more complex approaches developed a personal idea or concept and conveyed it in the design. These approaches correspond with belief mode and design mode. For example, design mode implies asking how ideas can be used, what are their strengths and weaknesses in this regard and how can the ideas be improved and elaborated (see Bereiter & Scardamalia, 2003).

Designers often collect and organize ready-made material that they use for inspiration in their design process (Eckert & Stacey, 2000; Keller, Pasman, & Stappers, 2006). Laamanen and Seitamaa-Hakkarainen (2009) found two kinds of sources of inspirations related to textile design process: explicit external inspiration sources and internal sources. The explicit external sources were concrete objects such as a story, picture, real artefact and material, whereas the abstract sources reflected subjects' own internal experiences such as memory and impression. In the field of art and craft education, Mui (2010) has observed barriers to adopt inquiry-based learning. Students' preconceptions about learning can become obstacles to using the inquiry-based learning approach. For example, students may favour technique-based learning instead of inquiry-based learning. In addition, some student may be reluctant to carry out inquiries or experiments prior to the final artwork production.

The students must choose their own strategies and plan their actions in order to solve any problems they have identified. Kruger and Cross (2006) have identified four cognitive strategies employed by the designers: problem driven, solution driven, information driven and knowledge driven design strategies. Problem driven designers focus on defining the problem and using information that is strictly needed to solve the problem whereas solution driven designers focus on generating solutions. Information driven designers focus on gathering information from external sources, and developing a solution on the basis of this information. Knowledge driven designers focus on developing a solution on the basis of their prior knowledge.

Seitamaa-Hakkarainen (2000; Seitamaa-Hakkarainen & Hakkarainen, 2001) has divided the textile design process into the composition space, which represents visual designing, and the construction space, which represents technical designing. The composition space contains the visual problems that are related, for example, to form, figure and colour. In turn, the construction space contains the technical problems, such as those related to the material, structure and production. In the design process, the visual and technical design elements must be considered and related to each other and within the constraints in order to create a functional and aesthetic solution (see also Lamb & Kallal, 1992). A design space forms the external frame to designing, but the set of possible acts is usually so wide that the designer is able to study only a part of the design space at a realistic time. Cognitive research on expertise in design (Cross, 2004; Seitamaa-Hakkarainen, 2000) indicates that novices tend to generate problem solutions without engaging in extensive problem structuring whereas experts focus on structuring and restructuring the problem before proposing solutions.

The dual-space model (see Seitamaa-Hakkarainen, 2000, 57) shows how design thinking is connected to the visualization of the design product. The sketchy model refers to the arrangement of visual design elements, whereas the operation model provides a more concrete model of the technical design elements. Working with various design models allows a greater degree of flexibility for the designer than working with the details mentally. Cardella, Atman, and Adams (2006) suggest that student designers should be encouraged to develop their representation skills and to use more representational activities. A design idea is not necessarily well detailed or articulated in the early stages of the design process. Yet, this kind of externalisation helps intangible ideas to become concrete and allows them to be reworked and renegotiated.

3. The aim of the study

The study was conducted to explore learning sources and design models that textile teacher students used to solve the design task in the sewing course. The main questions in this study include:

- What kinds of the sources and models are used by students to overcome design problems?
- What is the qualitative variation in approaches adopted by textile teacher students within the design task?

4. Method

4.1. Participants and data collection

The sewing course took place at the University of Helsinki, Department of Teacher Education. The researcher of this study worked as a teacher in this course. The general aim of the course was to study sewing tools, spaces and techniques. In the first part of the course, first-year textile teacher students (N=26) received traditional classroom style instruction. Following the demonstrations, each student produced the pre-arranged construction details such as seams, zippers, and pockets. In the second part of the course, each student framed a clothing design task for another student and brought an approximately 50 x 50 centimetres piece of clothing fabric for a construction detail. The students were asked to design functionally and aesthetically delightful clothes for their classmates, and further, to design and produce a construction detail for this garment.

In the second part of the course, the students were expected to engage in an autonomous learning and designing process. In addition, they were instructed to provide the frequent diary reports of their process. Data collection was based on event-based diaries (see Bolger, 2003) completed throughout the process. The event-contingent study required students to fill a structured diary form each time the event in question occurred—that is, when the students focused either on exploring existing materials or on designing clothing construction. In addition, the students numbered and returned all sketches, drawings, and prototypes created during the process.

4.2. Method of data analysis

The data collected from the students was analysed with reference to Seitamaa-Hakkarainen's (2000) model of the textile design process. The qualitative content analysis was based both on the theory and data driven approaches. Diaries and productions were scanned and analysed using ATLAS/ti computer program. The students' reports and design representations were divided into segments (f=499) and classified according to variables that represented essential aspects of inquiry-based approach. The first category consisted of the following information and inspiration sources: 1) visual and conceptual, 2) material, and 3) social. In the second category, modelling, the main division was made between 1) sketchy model and 2) operational model.

In the next step, a graphical technique called scatter diagram was used to illustrate the main characteristics of inquiry-based learning. As expected, two selected variables (i.e., sources and models) were suited for assessing the qualitative variation in approaches adopted by textile teacher students within the design task. On the basis of the scatter diagram, the following four orientations were identified: 1) source-oriented inquiry, 2) model-oriented inquiry, 3) mixed inquiry, and 4) single insight.

The interest was not only in the inquiry process but also in the outcomes. Assessment of the final designs and details was made by an independent textile teacher. The teacher assessed on a 1–3 scale both the clothing design (i.e., creativity, personality, and feasibility) and the construction detail (i.e., quality

and functionality) produced by the student. The sum of these scores was an overall assessment of the inquiry-based task.

5. Results

The results highlighted various aspects of inquiry-based learning. The analysis indicated that the students used three types of sources. Visual and conceptual sources included references to the books, magazines, and Internet. Obtainable clothes and fabrics worked as material sources. Discussion with the teacher, classmate or other person was classified into social source.

The most of the students (N=14) selected a pocket as a construction detail. The rest of the students (N=12) designed e.g., a cuff, closure or decorative structure. The sketchy model was defined to consist of visual ideas related to a garment or a construction detail. The operational model covered the technical aspects of the construction detail i.e., drawings and experiments related to the structures and materials. The data contained 499 students' statements and representations related to separate sources and models. The students appeared to emphasize sketchy models (48%; *f*=239), whereas the proportion of information and inspiration sources was 36% (*f*=181) and operation models 16% (*f*=79). In the further analysis, sketchy models and operation models were merged into one category.

The scatter diagram (see Fig. 1) revealed that each student had an individual style for ideation and modelling. Two students (no. 5 and 12) represented most clearly source-oriented inquiry. They used a wide range of sources in order to understand a particular theme and they demonstrated this through their own design. Two students (no. 19 and 23) focused on developing design ideas by drawing and making models. However, they cited only a few sources during the process. This approach was named model-oriented inquiry. The third approach was a combination of source-oriented and model-oriented inquiries. Three students (no. 15, 18, and 21) represented evidently this mixed inquiry. Their own drawing and experimental work progressed parallel with the process of collecting informational and inspirational material. The assessment of the designs indicated that the students who had an intensive inquiry approach tended to also have high overall scores. Five students (no. 5, 12, 18, 23, and 25) got the highest scores in respect to both creativity and quality.

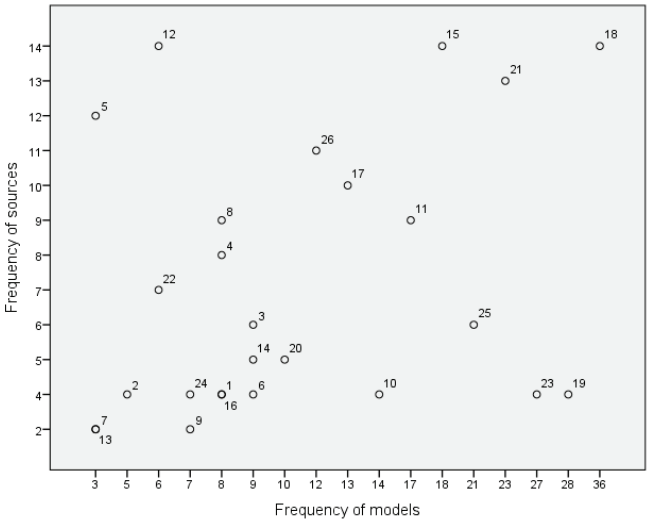

Fig. 1. Scatter diagram of sources and models

In addition to the three inquiry-based approaches, the results indicated that some students concentrated to reproduce visual and technical elements of the found material in a final product. Alternatively, some students (no. 7, 9, and 13) created a strong mental image of the construction detail without searching for inspiration or information sources. Nor did they develop the idea further by sketching or modelling. The distribution of the scores was large between these students; the lowest score was 2/6 and the highest one 5/6. In the following, the successful types of inquiries are described through examples.

5.1. Source-oriented inquiry

Students in the source-oriented approach collected a lot of material for design process. Typically they studied a certain theme like Hollywood glamour or fashion created by Coco Chanel. They created a strong mental image of the construction detail without engaging an intensive sketching or modelling process. Cecilia (student no. 5) received a checked clothing fabric and a wish for a special coat design. She described her information gathering process as follows:

> *The first thing I did was buy the newest copy of Vogue as a source of inspiration on my way home. The magazine by chance happened to have three versions of the same model of beige basic trench coat with different lengths. I also found a report of fashion portraits from the magazine that were done in a 50's kind of way. The pictures gave me the idea of a slightly romanticized coat that the colour of the fabric seemed to me to support. At the same time I sketched out the model of the coat on the train ride home. At home I looked at two of my own trench coats as well as their details.*

The analysis revealed that Cecilia used several (f=12) inspiration and information sources but produced just two sketchy models and one operation model. However, she succeeded to create a unique and high-quality pocket (see Fig. 2), which highlighted the spirit of the coat's design. The rickrack embellished the appearance of the final construction detail.

Fig. 2. Cecilia's pocket based on the source-oriented inquiry

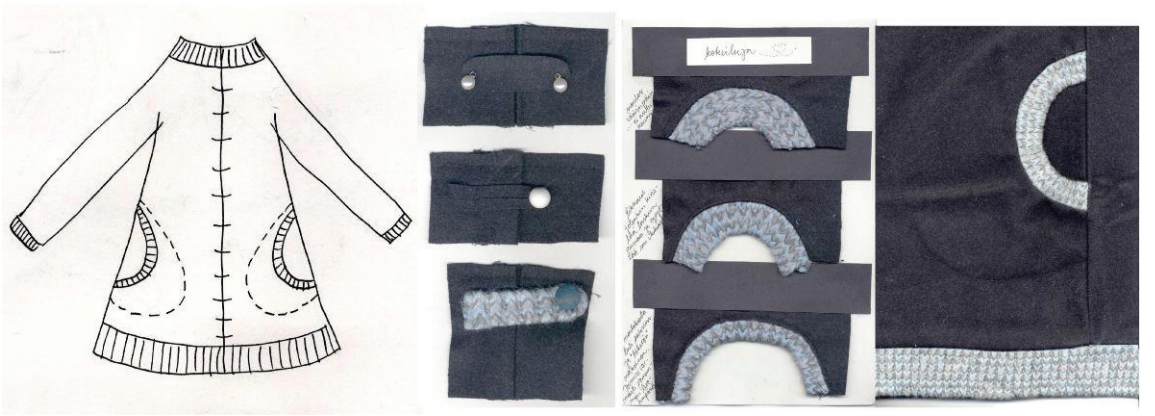

Fig. 3. Rebecca's pocket based on the model-oriented inquiry

5.2. Model-oriented inquiry

Students in the model-oriented approach developed design ideas by drawing and making models. They had only a limited number of inspiration and information sources. Many students combined details and another material with the preliminary material. For example, Rebecca (student no. 19) received dark grey wool for a coat design. Later on, she found knitted fabric for details. Rebecca produced many sketchy models (*f*=14) and operation models (*f*=14). In other words, Rebecca sketched several collar and closure solutions for a coat. In addition, she sewed alternative closure and pocket details (see Fig. 3). In the inquiry process, answers are not prescribed or predetermined. Unexpected results may lead to the further refinement of skills or ideas. Rebecca expressed a turning point like this:

> *I looked at some of the zipper and button applications that I had done and I wasn't really happy with them. It was hard to use the nice woollen rib that I had found for them and I still wanted to use the rib in the coat. I thought that it really put some life into the dark woollen fabric and cheer it up. So I shifted to thinking about the coat's pocket. In the sketch I had drawn a ribbed decoration for the top of the pocket. So I started planning a pocket. I did some sewing experiments on it.*

As opposed to Rebecca's inquiry process, most of the students produced more sketchy models than operational models. One reason for this is that the preliminary clothing design was based on visualizing and sketching, not on modelling.

5.3. Mixed inquiry

Students in the mixed approach collected a rich amount of material in order to arouse initial ideas. In addition, they started to develop the idea further by sketching and modelling. Patricia (student no. 18) received a challenging organza fabric and she had free hand to create something impressive. Patricia was the most active student in both searching inspiration and information (*f*=14) and producing sketchy and operation models (*f*=36). Especially, she created plenty of sketches for a little black dress with organza details (see Fig. 4) and reflected her process in the diary as follows:

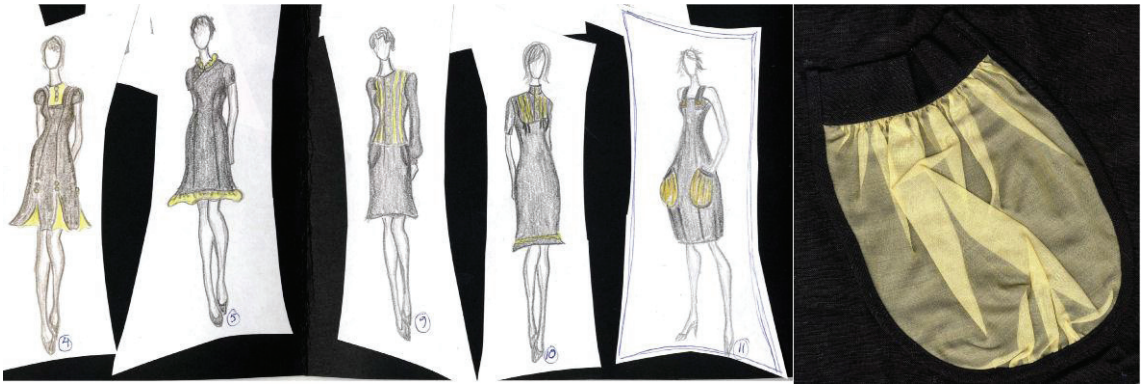

Fig. 4. Patricia's pocket based on the mixed inquiry

On my way home on the bus I started to think about different possibilities and I made drawings based on them later. I also got some more ideas later when I was watching television and browsing through some magazines. Because I ended up with a lot of sketches, it was hard for me to decide based on what I would start working on a detail. There were a lot of options, from gathering and pleating to plackets. As I thought about the task the biggest problem was the transparency of the fabric.

Finally, Patricia selected the idea on the right (see Fig. 4) and created a transparent pocket as a final construction detail. She decided to use linen as dress fabric, and also framed the pocket with a linen ribbon.

5.4. Single insight

A few students built a design process around the given fabric. They created a strong mental image of the construction detail without using a variety of sources and models. For example, Lisa (student no. 13) managed to create an interesting construction detail by exploiting two-sided Jacquard fabric:

The matching was problematic because the leaf patterns weren't symmetrical. There were also constraints concerning the amount of fabric. The matching would have required more than the 0.5 metres of fabric that I had. Finally, my plan succeeded.

Figure 5 presents Lisa's idea of the coat with richly coloured pockets. The pockets were sewed between the vertical seams. In this case, a single insight resulted in a successful construction detail.

6. Discussion

One central aspect of the design process is a designer's way of using a variety of sources, written notes, visual representations, and concrete models for representing, developing, and storing emerging ideas. It appeared that the majority of the students were able to conduct a progressive inquiry process which helped them in the creation of the construction detail. In the two inquiry approaches (i.e., model-oriented and mixed inquiry), students were open-minded about considering alternative ideas. They were able to see that inspirational and information sources, and further, sketchy and operational models were necessary for this learning approach.

Fig. 5. Lisa's pocket based on the single insight

In accordance with Mui's (2010) findings, this study touched on the inquiry barriers. Some students' preconceived concepts about sewing skills and a resistance to change their existing learning style to the new mode of learning became an obstacle to the implementation of inquiry-based learning. For this reason, the teacher must convince students of the beneficial effects of inquiry-based learning by making explicit the aim of learning, and by helping the students to adopt new roles relevant to this learning approach. The students' view of learning as simply the acquisition of knowledge and skills should be changed to a view of learning as knowledge creation (see Hakkarainen, Palonen, Paavola, & Lehtinen, 2004), and the process of learning should be regarded as equally important as the product of learning.

In order to be more effective, the objectives of inquiry-based learning and the criteria for assessment should be clearly explained at the early stage of the students' learning. The results of this study could facilitate inquiry-based learning when the prospective students see the correlation between the scores and inquiry approaches. The possibilities are endless when the students learn to use external information and inspirational sources in parallel with different modelling techniques.

The event-based diary method used in this study included some risks and limitations. The students may not reliably identify each relevant event or they may forget to mark these events on the diary. There is a risk of retrospection error, where students rely on recollection to complete missed notes. In addition, the experience of the diary study may cause performance that fits with those measured in the diary. On second thought, a diary method can be a part of a reflective practice that facilitates students' inquiry-based learning.

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